WHAT IS CLAIMED IS:

1. An intake-air control system for an engine employing a variable intake-air quantity mechanism that variably controls a quantity of fresh air entering the engine and a variable compression ratio mechanism that variably controls a compression ratio of the engine, comprising:

sensors that detect engine operating conditions and the compression ratio, and

a control unit configured to be electronically connected to the sensors, the variable intake-air quantity mechanism, and the variable compression ratio mechanism for controlling the variable intake-air quantity mechanism based on the compression ratio as well as the engine operating conditions.

2. The intake-air control system as claimed in claim 1, wherein:

the control unit comprises:

(a) a first required load setting section that sets a first required load based on the engine operating conditions;

(b) an upper limit load setting section that sets an upper limit load based on the compression ratio; and

(c) a second required load setting section that sets a second required load by limiting the first required load by the upper limit load, and

wherein the control unit controls the variable intake-air quantity mechanism to satisfy the second required load, while controlling the compression ratio based on the engine operating conditions by the variable compression ratio mechanism.

3. The intake-air control system as claimed in claim 2, wherein:

the second required load is set as a lower one of the first required load and the upper limit load.

4. The intake-air control system as claimed in claim 1, wherein:

the control unit comprises:

(a) a first required load setting section that sets a first required load based on the engine operating conditions;

(b) an upper limit load setting section that sets an upper limit load based on the compression ratio;

(c) a second required load setting section that sets a second required load by limiting the first required load by the upper limit load;

(d) a third required load setting section that sets a third required load by making a predetermined phase-lag compensation for the second required load; and

(e) a fourth required load setting section that sets a lower one of the first and third required loads as a fourth required load,

wherein the control unit controls the variable intake-air quantity mechanism to satisfy the fourth required load, while controlling the compression ratio based on the engine operating conditions by the variable compression ratio mechanism.

5. The intake-air control system as claimed in claim 4, wherein:

the second required load is set as a lower one of the first required load and the upper limit load.

6. The intake-air control system as claimed in claim 2, wherein:

the upper limit load is set to decrease, as the compression ratio increases.

7. The intake-air control system as claimed in claim 2, wherein:

the upper limit load is set, considering a cylinder wall temperature as well as the compression ratio.

8. The intake-air control system as claimed in claim 7, wherein:

the upper limit load is set to decrease, as the cylinder wall temperature increases.

9. The intake-air control system as claimed in claim 1, wherein:

the variable intake-air quantity mechanism comprises an electronically-controlled throttle mechanism, which is disposed in an induction system of the engine and whose throttle opening is changeable for controlling the quantity of fresh air entering the engine.

10. The intake-air control system as claimed in claim 1, wherein:

the variable intake-air quantity mechanism comprises a variable intake valve characteristic control mechanism whose valve characteristic is changeable for controlling the quantity of fresh air entering the engine.

11. The intake-air control system as claimed in claim 1, wherein:

the variable compression ratio mechanism comprises:

(a) an upper link adapted to be mechanically linked at one end to a reciprocating piston via a piston pin;

(b) a lower link adapted to be mechanically linked to the other end of the upper link via a first connecting pin and rotatably mounted on a crankpin of an engine crankshaft;

(c) a control link adapted to be mechanically linked at one end to the lower link via a second connecting pin and rockably supported at the other end by an engine body so that oscillating motion of the control link relative to the engine body is permitted; and

(d) a control shaft fitted to the other end of the control link for varying a center of the oscillating motion of the control link relative to the engine body when changing the compression ratio.

12. The intake-air control system as claimed in claim 11, wherein:

the control shaft comprises a relatively small-diameter shaft portion and a relatively large-diameter shaft portion whose axis is eccentric to an axis of the small-diameter shaft portion and whose outer periphery is rotatably fitted to the other end of the control link, the small-diameter shaft portion and the large-diameter shaft portion being fixedly connected to each other, and

which further comprises an actuator having a drive shaft, which is connected to the small-diameter shaft portion of the control shaft for varying the center of the oscillating motion of the control link relative to the engine body by driving the control shaft when changing the compression ratio.

13. An intake-air control system for an engine enabling an intake-air quantity and a compression ratio to be variably controlled, comprising:

sensors that detect engine operating conditions and the compression ratio;

a control unit configured to be electronically connected to the sensors for feedback-controlling the intake-air quantity based on the compression ratio as well as the engine operating conditions, while feedback-controlling the compression ratio based on the engine operating conditions; and

the control unit executing phase-matching between an intake-air quantity change occurring based on intake-air quantity control and a compression ratio change occurring based on compression ratio control, considering a relatively slower response in the compression ratio change than a response in the intake-air quantity change.

14. The intake-air control system as claimed in claim 13, wherein:

the control unit puts, based on the compression ratio, an upper limit of a first required load corresponding to the intake-air quantity that is determined based on the engine operating conditions, for producing a second required load limited within the upper limit; and

the control unit feedback-controls the intake-air quantity to satisfy the second required load, while feedback-controlling the compression ratio based on the engine operating conditions.

15. The intake-air control system as claimed in claim 13, wherein:

the control unit puts, based on the compression ratio, an upper limit of a first required load corresponding to the intake-air quantity that is determined based on the engine

operating conditions, for producing a second required load limited within the upper limit;

the control unit sets a third required load by making a predetermined phase-lag compensation for the second required load;

the control unit sets a lower one of the first and third required loads as a fourth required load; and

the control unit feedback-controls the intake-air quantity to satisfy the fourth required load, while feedback-controlling the compression ratio based on the engine operating conditions.

16. The intake-air control system as claimed in claim 14, wherein:

the upper limit is set to decrease, as the compression ratio increases.

17. The intake-air control system as claimed in claim 14, wherein:

the upper limit is set, considering a cylinder wall temperature as well as the compression ratio.

18. The intake-air control system as claimed in claim 17, wherein:

the upper limit is set to decrease, as the cylinder wall temperature increases.

19. An intake-air control system for an engine employing a variable intake-air quantity mechanism that variably controls a quantity of fresh air entering the engine and a variable compression ratio mechanism that variably controls a compression ratio of the engine, comprising:

sensor means for detecting engine operating conditions and the compression ratio; and

control means configured to be electronically connected to the sensor means, the variable intake-air quantity mechanism, and the variable compression ratio mechanism for controlling the variable intake-air quantity mechanism based on the compression ratio as well as the engine operating conditions.

20. A method of variably controlling an intake-air quantity of fresh air entering an engine and a compression ratio of the engine, the method comprising:

detecting engine operating conditions and the compression ratio;

feedback-controlling the intake-air quantity based on the compression ratio as well as the engine operating conditions, while feedback-controlling the compression ratio based on the engine operating conditions; and

executing phase-matching between an intake-air quantity change occurring based on intake-air quantity control and a compression ratio change occurring based on compression ratio control, considering a relatively slower response in the compression ratio change than a response in the intake-air quantity change.

21. The method as claimed in claim 20, further comprising:

putting, based on the compression ratio, an upper limit of a first required load corresponding to the intake-air quantity that is determined based on the engine operating conditions, for producing a second required load limited within the upper limit; and

feedback-controlling the intake-air quantity to satisfy the second required load, while feedback-controlling the compression ratio based on the engine operating conditions.

22. The method as claimed in claim 20, further comprising:

putting, based on the compression ratio, an upper limit of a first required load corresponding to the intake-air quantity that is determined based on the engine operating conditions, for producing a second required load limited within the upper limit;

determining a third required load by making a predetermined phase-lag compensation for the second required load;

determining a lower one of the first and third required loads as a fourth required load; and

feedback-controlling the intake-air quantity to satisfy the fourth required load, while feedback-controlling the compression ratio based on the engine operating conditions.